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Article

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Novel Approach to Measuring Business Process Performance

*Barbara SIMEUNOVIĆ – Ivan TOMAŠEVIĆ – Dragoslav SLOVIĆ – Dragana STOJANOVIĆ**

Abstract

In the literature, as in practice, there are numerous models for measuring business performance but only a few of them are focused on the business processes, and have integrated process measures with strategic goals, in a way to enable companies to measure progress towards achieving business goals. This paper seeks to address these issues by proposing a new process performance measurement (PPM) model, named GPI model. Model was designed using evidence from the literature, it was tested through multiple case study research, and then it was modified and verified. The GPI model has the potential to become a useful tool for managers in several ways: firstly, the model can be used as a guidance for establishing PPM system that is aligned with strategic goals of company; secondly, the model can be used as it is, with a slight model customization; and thirdly, the universal list of Process performance indicators can be used as a source for best practice.

Keywords: *performance measurement, performance indicators, process measurement*

JEL Classification: L21, L25

Introduction

In order to achieve sustainable performance of business system, it's crucial for companies to manage their processes. According to Glova and Mrázková (2018, p. 665) "well established organizational processes are recognizably more value able than disorganized management".

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Since business processes (BP) management is becoming recognized as a necessity in a large number of companies, many authors recognize the importance of process-oriented performance measurement systems (e.g. Heckl and Moormann, 2010; Popova and Sharpanskykh, 2010). In order to measure progress towards achieving business goals, it is important for companies to evaluate the performance of their BPs by means of so-called Process Performance Indicators (PPIs) (Del-Rio-Ortega et al., 2012). According to Gavurová (2011), performance measurement (PM) is currently developing rapidly in the form of new concepts for different BPs.

In the literature, as in practice, there is number of models and frameworks (e.g. Brown, 1996; de Guerny, Guiriec and Lavergne, 1990; EFQM, 2009; Gündüz, 2015; Harmon, 2019; Heckl and Moormann, 2010; Kaplan and Norton, 1993; Lynch and Cross, 1991; Popova and Sharpanskykh, 2010; ...) that provide guidelines for the PM system design. PM approaches, as well as performance evaluation tools, are significantly changed during the time (Šofranková, Kiseľáková and Horváthová, 2017, p. 645).

However, despite the existence of many tools, procedures, or methodologies, there is no universal approach to measuring business performance (Teplická, Daubner and Augustínová, 2015), that would enable and facilitate PM in every company, regardless of its activity, ownership and size.

In addition, most of these PM models are not focused on BPs (Glavan, 2011; Hernaus, Pejić Bach and Bosilj Vukšić, 2012; Wieland et al., 2015). As recent research suggests a strong link between BP performance and organizational performance (Hernaus, Pejić Bach and Bosilj Vukšić, 2012; Van Looy and Shafagatova, 2016), a new PM approach is needed which can help companies to evaluate performance of their processes in an integrated manner (Shah et al., 2012).

Therefore, what an organization really needs are measurements that start with the organization's goals (Gündüz, 2015; Kennerley and Neely, 2002; Parmenter, 2010) and that are cascaded to the processes. In this way, it's ensured that the system will provide information on whether strategic goals are successfully achieved. PPM is an integral part of the organization, which means that organizations achieve goals by affecting on different organizational processes that deliver organizational performance (Pavlov and Bourne, 2011).

Furthermore, according to authors' knowledge, none of PPM models link organizational goals and PPIs directly. This is important because the environment is dynamically evolving, and goals, as well as the organization's strategy should be changed, and when they change, some of PPIs also have to be changed (Driva, Pawar and Menon, 2000; Kennerley and Neely, 2002; Samsonowa, Buxmann and Gerteis, 2009).

This paper describes the research conducted in order to fill the gaps in the literature by developing PPM model. The new model, named "GPI model" meets the following requirements: firstly, the measurement system is based on processes, rather than organizational units; secondly, performance indicators are process specific and derived from strategic goals at the highest level of company; and thirdly, interdependencies between strategic goals and PPIs have been identified, in order to facilitate organizations to adapt their PPIs according to change of their strategic goals and directions.

Reminder of the paper is organized as follows: after the literature review (section 1), research methodology, initial GPI model, as well as the process of collecting case study data to further develop the model is presented in section 2. The case study results are then presented and discussed in section 3, which led to PPM model modification and extension. The paper closes with conclusions, managerial implications, limitations and suggestions for specific research directions.

1. Literature Review

In order to measure performances of its business processes, companies need to establish a process architecture (enterprise process map), which serves as the basis of a PPM system (Harmon, 2019; Heckl and Moormann, 2010). According to Harmon (2019, p. xxxi), "leading organizations have created comprehensive BP architectures and have then moved on to create management systems that measure process performance and assign specific managers with responsibilities for assuring that processes perform as necessary".

In the literature, two groups of papers dealing with PM can be identified: (1) papers focused on systems or concepts for PM, and (2) papers focused on PPIs and their categorization and operationalization (Van Looy and Shafagatova, 2016).

Regarding a first group, a number of models and methods for establishing the PM systems can be found in the literature. However, the difference should be made between models that are focused on entire business (e.g. de Guerny, Guiriec and Lavergne, 1990; EFQM, 2009; Kaplan and Norton, 1993) and models that are focused on a single BP (e.g. Brown, 1996; Kueng, 2000; Yen, 2009).

Among the models that are focused on entire business, one of the best known model is certainly Balanced Scorecard (BSC) (Kaplan and Norton, 1993), which align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organization performance against strategic goals (Boka, 2019, p. 9).

However, although this model is very useful, it should be more closely tied to a process view of the organization (Harmon, 2019, p. 111). BSC is focused on corporations or organisational units, but lacks a detailed and holistic PPM approach (List and Machaczek, 2004, p. 1). BSC looks at BPs only as far as they have a great impact on customer satisfaction and achieve an organisation's financial objectives (Kueng, 2000; List and Machaczek, 2004, p. 1). In that way, used as it is in most companies, the BSC system tends to support and entrench functional specialization (Harmon, 2019, p. 112). Furthermore, use of BSC without adaptation to other existing elements of the management system, leads to the lack of the desired results of the goals (Malova, 2010; Ogloblin, Malanina and Vikhoreva, 2019, p. 3). Also, the procedure for redesigning indicators in case of changes in the environment is extremely laborious (Ogloblin, Malanina and Vikhoreva, 2019, p. 4).

Another model from this group is the EFQM model (EFQM, 2009), which has been widely used to assess an organization's progress towards excellence. Although not designed as PM framework, this model takes a broader view of performance, addressing many of the areas of performance not considered by the BSC (Neely, Kennerley and Adams, 2007, p. 149). However, EFQM doesn't propose any method to review the measurement system when the strategy would change (Poot, 2018, p. 40). Also, its failure to focus on specific areas in which performances are relevant can lead to an inadequate performance assessment (Parisi, 2010). In this group are also the Performance SMART pyramid (Lynch and Cross, 1991) which attempts to integrate strategic goals with operational performance indicators, as well as Tableau de Board (de Guerny, Guiriec and Lavergne, 1990) which explicitly shows the fact that performance measures should be integrated through the functions of the organization and through its hierarchy (Bordes and Toussaint, 2009). Although they made significant progress in PM of the organization, these models do not provide a basis for PPM, but rather the framework for a corporate PM system.

Regarding the models that are focused on a single BP, one of the first was Brown's macro process model of the organization (Brown, 1996), which shows clear links between five phases in a BP and their performance measures. Kueng (2000) also emphasizes the importance of measuring performance of BPs, by identification of its stakeholders, process goals, and, in accordance with goals, definition of PPIs. Yen (2009) proposed a new approach for creating BP measures that combines all relevant individual performance measures into a comprehensive PPI reflecting the views of all stakeholders. Although these authors recognized the importance of PPM, and made a significant contribution in this regard, they are focused on the single BP, not on the business as a whole.

When it comes to the second group, there are many papers dealing with definition of PPIs, and their usage in certain types of organizations or business areas, or processes (e.g. Del-RíO-Ortega et al., 2013; Kohlbacher and Gruenwald, 2011; Parmenter, 2010). They are mainly limited to defining a performance perspective, with possible examples or steps for deriving performance indicators (Neely et al., 2000), but without offering concrete PPIs. Although most authors agree that PPIs must be linked to the goals and strategies of the organization, there is no consensus in the existing PPI literature on what types or dimensions of PPI should be measured. Franceschini, Galetto and Maisano (2019, p. 134) state that most PPIs can be linked to the following three types: (1) effectiveness (the degree to which process output conforms to requirements); (2) efficiency (the degree to which process produces the required output at minimum resource cost); and (3) customer care (the degree of satisfaction of process users). Kronz (2006) and Del-RíO-Ortega et al. (2013) also think that key PPIs must provide a clear conclusion on the effectiveness of the process and its effectiveness. Dumas et al. (2013) identified four dimensions of process performance: time, cost, quality and flexibility (Bosilj-Vukšić, Glavan and Suša, 2015). When it comes to determining PPIs, there is no unique and universal approach in the literature. According to Kueng (2000), there are two approaches for selecting appropriate PPIs: using a generic set of PPIs and choosing the right ones; or starting from scratch. He believes that the second option is better because in this way PPIs can be defined at the appropriate level of detail, and precisely adjusted to the process being measured. However, this option is time-consuming, and therefore the usage of the generic set of PPIs should be considered. Van Looy and Shafagatova (2016) proposed an expanded list of measurable PPIs, categorized into recognized performance perspectives, which can be adapted to different purposes, but they did not directly link them to business goals.

Another issue that should be mention regarding the PPIs determination, and PPM system implementation in general, is their dynamic nature. PPIs, as well as the organization itself, must be flexible according to the changes (Driva, Pawar and Menon, 2000; Poot, 2018; Samsonowa, Buxmann and Gerteis, 2009). In addition, PM models that are focused on processes were criticized for not sufficiently specifying how business (process) performance indicators can be selected and operationalized (Shah et al., 2012).

Based on the above, the three main issues can be defined regarding the PM:

1. PM systems should be based on BPs. Although only comprehensive PPM can make a major contribution to business success, most companies still struggle with implementation of process-based performance measures (Harmon, 2019; Hernaus, Pejić Bach and Bosilj Vukšić, 2012), that should be integrated with

strategic goals (Bosilj-Vukšić, Glavan and Suša, 2015; Harmon, 2019; Simeunović, 2015). The PM system should be based on BPs rather than on organizational units (Glavan, 2011; Hernaus, Pejić Bach and Bosilj Vukšić, 2012; Kueng, 2000), in order to achieve alignment and common focus across separate organizational units (Hammer, 2007; Kohlbacher and Gruenwald, 2011). Focusing on PPIs also helps organization to define and measure progress towards their goals.

2. Even when PM systems are process-based, BPs are weakly related to company's strategic goals. According to Harmon (2019, p. 122) "most companies rarely have their measures tightly integrated with their strategic goals". This integration is important, because companies operate in a dynamic environment, and they constantly adapt their strategic goals and strategies to changes in the environment, and in accordance with changing of goals and strategies, PPIs need to be changed (Driva, Pawar and Menon, 2000; Kennerley and Neely, 2002; Poot, 2018; Samsonowa, Buxmann and Gerteis, 2009; Simeunović, 2015). Instead of developing a new PPM system with each change, it is much more reasonable to define the main characteristics, implementation steps, but also the links between goals, processes and PPIs, and on these grounds, each organization can begin to create and implement a unique and specific PPM system (Simeunović, 2015; Striteska and Spickova, 2012). It is therefore essential that companies determine relevant indicators, their linkages with the company's strategic goals and their dependence on activities that are performed (Popova and Sharpanskykh, 2010; Simeunović, 2015). This will then result in strategic performance information that supports senior management in targeting the desired strategic direction.

3. There is no unique and universal approach for determining PPIs. PPM models do not specify sufficiently how PPIs can be chosen and operationalized (Shah et al., 2012; Van Looy and Shafagatova, 2016).

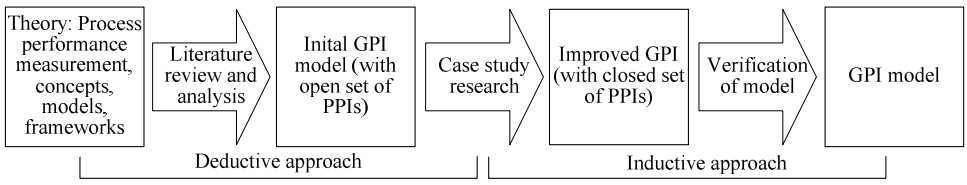
2. Research Methodology

In order to address issues found in the literature, we first used deductive approach (Gill and Johnson, 2002; Muda and Hendry, 2002), by which we developed an initial PPM model based on literature research and previous practical experiences of authors, before any data collection. This is then followed by an inductive research, in which data was gathered from 31 process-oriented companies, through the multiple case study research, which enables new insights and offers high validity with practitioners (Ashby, 2016). The type of evidence sought was applicability and usefulness of model; an understanding of relationship between strategic goals, key processes and PPIs and opinions on what PPIs are the most appropriate for monitoring accomplishment of strategic goals. The

idea was to identify what strategic goals are commonly defined in companies, and with what PPIs they can be monitored, which would allow to define some generic links between them, and upgrade the initial model. The research methodology is shown in the Figure 1.

Figure 1

Research Methodology



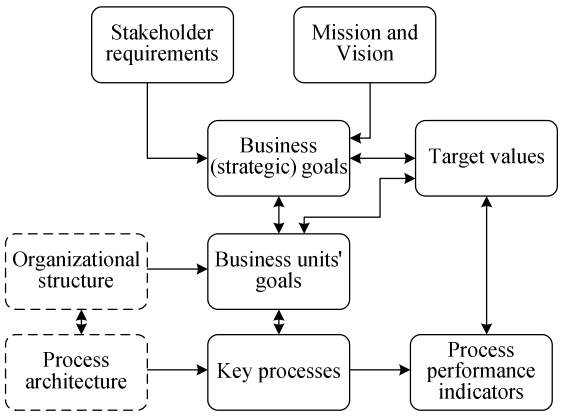
Source: Authors.

2.1. Initial Model Derivation

Based from literature research and some practical experiences of the authors, an initial model for PPM was developed (Figure 2). The model was named "GPI model", as acronym of three words that formed its structure: Goals, Processes and Indicators.

Figure 2

Initial GPI Model



Source: Authors.

According to recommendations in literature (Heckl and Moormann, 2010; Popova and Sharpanskykh, 2010; Yen, 2009), model starts with identification of company's stakeholders and their requirements, as a basis for defining business (strategic) goals of company. These goals should be aligned with the mission and

vision of the company, as they represent the company's aspirations in the process of achieving the vision and meeting the company's mission. It is recommended that goals are defined according to the SMART (Specific and Simple; Measurable and Meaningful; Achievable; Realistic and Responsible; and Timed) principles (Jeston and Nelis, 2008). Acording to Pulakos (2009, p. 40), „one best practice in PM systems is to establish a hierarchy of goals where goals at each organizational level support goals directly relevant to the next level" in the hierarchy. So, the next step would be to decompose strategic goals into lower level goals, i.e. goals of the company's business units (according to organizational structure). If an organization achieves goals of its business units, the strategic goals will be achieved too. In this way, employees can see how all the work in the company fits together, and they would work in alignment to support the strategic direction of the company (Pulakos, 2009). Business unit' goals should also be defined according to SMART principles. Furthermore, in this step, it's necessary to define the units of measurement, target values (values that are required for goal achieving), the method of measuring these goals, and to describe how the trend of achieving these goals will be followed.

Companies achieve their goals by affecting multiple and different BPs that deliver organizational performance (Pavlov and Bourne, 2011; Yen, 2009). However, since it is impossible to measure performances of all processes, due to limited resources and time, considering that all performances are not equally important, efforts should be focused on measuring the performances of those processes (defined in process architecture) that lead to achievement of business unit' goals. These are key processes. So, the next logical step is to identify the key BPs that will be measured and managed.

It is very important to evaluate performance of key processes, since it helps organization to define and measure progress towards their goals (Del-RíO-Ortega et al., 2013). In order to accurately determine the performance of key process, it is necessary to define the indicators for their assessment. So, the next step would be derivation of PPIs. This includes definition of measures, their target values, procedures for data collection, and measurement frequency. The company should also define measurement points, i.e. the points in process at which data is collected for calculating PPIs. Measurement point should return one or more data items every time a process is executed. Data collected through PPM can be used also for process monitoring, continuous process improvement, process reengineering, BP management, business system management, etc (Radović et al., 2009).

This model assumes that the company has defined process architecture, and it is not applicable to companies that are not process-oriented, which can be considered as limitation of the model.

2.2. Case Study Design

To make the research conclusions as general as possible, it is essential to choose representative companies (Muda and Hendry, 2002). For this research, we approached companies which are ISO 9001 certified (according to Serbian Chamber of Commerce), as ISO certification (at least formally) requires the adoption of process approach.

T a b l e 1

Research Sample – A Closer Look at Selected Companies

Case	Description of Business Activity*	No. of employees	Founded Year	Size**
A	Manufacturing – Wood and wood products, furniture, paper and paper products	4	2002	S
B	Manufacturing – Metal and metal products	7	1993	S
C	Professional, Scientific and Technical – Architecture, engineering, technical and analysis	185	1989	M
D	Manufacturing – Textile, leather and other apparel products	18	1996	S
E	Manufacturing – Food, beverages and tobacco products	53	2003	M
F	Financial and Insurance Service – Banking activities	684	2007	L
G	Manufacturing – Food, beverages and tobacco products	20	1996	S
H	Trade – Wholesale Trading	3	1992	S
I	Financial and Insurance Service – Banking activities	561	1992	L
J	Manufacturing – Electrical equip., General and Special purpose Machinery and equipment	42	1998	S
K	Accommodation and Food Service – Food and beverage services	130	2004	M
L	Manufacturing – Food, beverages and tobacco products	174	1992	M
M	Manufacturing – Electrical equip., General and Special purpose Machinery and equipment	1 500	1948	L
N	Transport and storage – Land transport via Railways and Pipelines	18 356	2005	L
O	Manufacturing – Wood and wood products, furniture, paper and paper products	118	1982	M
P	Manufacturing – Computer, Electronic, Communication , control equipment	40	1992	S
Q	Support service to Organizations – Security and investigation activities	27	2005	S
R	Manufacturing – Electrical equip., General and Special purpose Machinery and equipment	8	1991	S
S	Transport and storage – Land Transport via Road	16	2010	S
T	Transport and storage – Land Transport via Road	5 944	1892	L
U	Manufacturing – Metal and metal products	74	1992	M
V	Trade – Wholesale Trading	4 600	1992	L
W	Manufacturing – Food, beverages and tobacco products	1 500	1952	L
X	Manufacturing – Wood and wood products, furniture, paper and paper products	33	2001	S
Y	Manufacturing – Plastic, non-metallic mineral, rubber, fabricated metal products	334	2002	L
Z	Manufacturing – Plastic, non-metallic mineral, rubber, fabricated metal products	76	2003	M
AA	Trade – Retail Trading	11	2008	S
BB	Support service to Organizations – Travel agency and tour operators	4	2011	S
CC	Manufacturing – Food, beverages and tobacco products	35	1996	S
DD	Education – Higher education, technical and vocational education	36	2005	S
EE	Arts, entertainment and recreation – Sports, amusement and recreation activities	72	1912	M

Note: * Principal business activities of the company – Companies Act, according to (Anon, 2013).
** Size of company: S-small company; M – medium company; L-Large company.

Source: Authors.

In order to participate in the research, companies were required to fulfill the following criteria: 1) companies identified and managed their processes, or at least, they established process architecture, and 2) companies have at least one year of experience with measuring PPIs. In total, 36 companies accepted to participate in research. Upon the review, we excluded five companies from our sample, as it was estimated that they do not fulfill one or both criteria, leaving 31 companies in our final sample. For confidentiality purposes, the names of the companies have been obscured. A description of the selected organizations is summarized in Table 1.

As illustrated in Table 1, the research sample of companies varied in terms of size, founded year and business industry. The size of the companies ranged from 3 to 18,356 employees, whereas the years of business operations ranged from four to 123 years (at the moment of research). Among those companies, 13 were service-oriented, 14 were manufacturing companies, while only four were operating both in service and manufacturing industry.

2.3. Data Sources

Data collection included the usage of three data sources. Firstly, all the cases were observed several times on-site by one of the authors, in order to observe daily operations and to better understand the companies' processes. Also, workers/officials in charge (at various positions) in each organization were interviewed. Interviews were conducted by one of the authors according to recommendations of Yin (2009). The questions were prepared for each organization individually, and distributed earlier so that the respondents would have time to prepare. Respondents included managers who had full knowledge and responsibility for the company's strategic goals as well as for the measuring PPIs. We also interviewed several workers in each company in order to evaluate how hard is it for them to "calculate" the values of PPIs, as well as to fulfil different types of records/measuring instruments that are necessary for calculating indicators and for completing reports for the management. The notes taken during the interviews and used in the research were approved by the respondents, as well as by the employer in charge in each company. In addition to interviews and direct observations of the sites, archival records were also used in order to gain profound understanding of the procedures in the studied companies. Out of the archival data used, the most significant ones were: the organizational scheme, process model (process map), quality manual, strategic business plan, KPI reports, financial reports, operating procedures, work instructions, management reviews, corrective and preventive action reports, job descriptions, etc. The numbers of data sources in each case, time for collecting data, as well as position of the employer in charge, are shown at Table 2.

T a b l e 2

Sources of Evidence

Case	Data collection			Duration of the study	External validation of model
	Onsite (days)	*Interviews (#)*	*e-mails (#)*		
A	4	2	8	1 month	Director (owner)
B	6	3	11	1 month	Executive manager (founder)
C	12	8	20+	8 months	Executive Director - projects and marketing
D	7	4	12	3 months	Quality Manager
E	9	14	15	6 months	Production Manager
F	18	20+	20+	13 months	Quality Manager
G	6	5	8	3 months	General Manager (owner)
H	3	3	8	1 month	Director (owner)
I	24	18	20+	1 year	Executive of the Business Technology and Organization Division
J	9	8	10	3 months	Quality Manager
K	12	12	18	6 months	Director of Operations
L	12	12	18	8 months	Director Operational Support and Develop.
M	22	20+	30+	1 year	Quality Manager
N	28	30+	40+	16 months	Quality Improvement Project Manager
O	9	10	20+	6 months	Process Engineer
P	8	12	10+	4 months	Program Manager
Q	6	7	12	2 months	Technical Director
R	4	6	6	1 month	Executive (founder)
S	6	9	15	1 month	Logistic Manager
T	18	20+	40+	15 months	Integrated Management System Manager
U	9	14	20+	6 months	Executive Manager
V	18	20+	30+	11 months	Project Manager
W	12	20+	30+	13 months	Production Manager
X	6	9	10+	3 months	Executive Director
Y	9	20+	20+	1 year	Chief Operating Officer
Z	8	18	20+	6 months	Process Engineer
AA	3	6	12	2 months	General Manager
BB	2	2	8	1 month	Director (owner)
CC	6	10	15	4 months	Production Manager
DD	4	8	14	2 months	Vice-Dean for Scientific Research
EE	8	12	20+	2 months	Secretary

Source: Authors.

This data collection phases were based on targeting different sources of evidences in each case study, so the requirement for data triangulation was fulfilled.

Internal validity was assisted through providing evidence of the links between strategic goals and the process performance indicators of each company. Selection of multiple cases from different industrial sectors provides external validity (Asif et al., 2010). Since we used various sources of information, we enforced reliability of the results, ensuring the same findings by repeating the case study research (Yin, 2009; Asif et al., 2010). The case study research was conducted during a seventeen-month period (October 2015 – February 2017). The collected data were then analyzed, coded and cross-verified in order to facilitate data categorization and enable their generalization. Based on those data, the initial model was upgraded with pre-defined set of strategic goals, PPIs and their interdependencies.

Next step was to visit the companies to discuss this improved model in each of them. The aim was to determine if new, extended model is usable for them, and if there are some modification on the model that need to be done. In this step, a more open discussion was carried out about the model, which was sent to companies one week before our visit. We also asked companies to send us report with conclusions from that visit. After gaining all thirty-one reports, we consider this model verified.

3. Results and Discussion

Results of case study (for each company) were as follows:

1. Conclusions about the applicability and usefulness of model, with explanation if something was difficult to apply. This was summarized in the form of table for each company. Here, due the volume, will be shown an example for company G (Table 3). Company G (small, very successful company that produces different types of wine) is selected arbitrarily as an example.
2. A fulfilled form containing identified stakeholders, strategic goals, business units' goals, key processes and their PPIs.
3. For each strategic goal a set of indicators to be monitored were derived.

Manuscript length restrictions do not allow comments and conclusions (shown in a table 3) of each company to be presented, described and clearly discussed here. In summary, according to comments and conclusions from companies, 23 companies have fully implemented the model, 6 companies had to adapt model, and 2 companies struggled with model implementation due to unclearly defined links between strategic goals and processes. However, after their analysis (single-case and cross-case), some conclusions have been drawn:

- companies from the case study supported this model, and consider it applicable and useful;
- large companies, that have several hierarchical levels highly recommended that business unit's goals should be decomposed to the lower levels goals (departments goals) in order to facilitate key processes identification;
- a small number of companies considered that the process goals should be defined in order to facilitate the PPIs definition as well as target values setting;
- most companies thought that although the model is applicable as it is, it would be much easier to have, for each business goal, a pre-defined set of generic PPIs from which the specific indicators that are most appropriate for the company, can be selected;
- several companies were struggling with the operationalization of PPIs, regarding performance evaluation of an organization's work routines.

T a b l e 3

Case Study Evidence Regarding the Applicability of Initial Model for Company G

Activity	Company response (short version)	Conclusion
Defining business (strategic) goals (according to the requirements of stakeholders, and mission and vision of the company)	So far, we have defined strategic goals by listening to the market, partners, vision and our intuition. Now, for the first time, we have explicitly linked our business goals with the stakeholders' requirements. Our goals have not changed (with this model) significantly, but for the first time, the goals related to the satisfaction of our employees were defined, which are in line with the company's strategic direction.	Agreed
Decomposing business goals into business units goals	Our common practice is to decompose business (strategic) goals into the goals of business units (there are 4 business units), and these goals are reviewed and adjusted once a month.	Agreed
Identification of key processes	We have been managing our key processes for 6 years, so this step was not a problem. Yet, we have identified one more process as the key process (related to human resources)	Agreed
PPIs definition	PPIs definition is challenging phase for us. We have determined what PPIs we need to monitor in order to achieve our goals, but we have problem with operationalization of some PPIs, regarding the measurements points, their calculation, etc.	Agreed, but instruction for their operationalization are needed
Target values setting	Our target values are already defined in business unit's goals, so it was easy to "transfer" them into target values for PPIs	Agreed
PPIs monitoring	We have developed forms for recording the values of PPIs, but it still happens that some "warning" values of certain indicators are noticed too late	Difficult, the standardized procedure for recording is lacking, as well as some kind of signals when something goes wrong

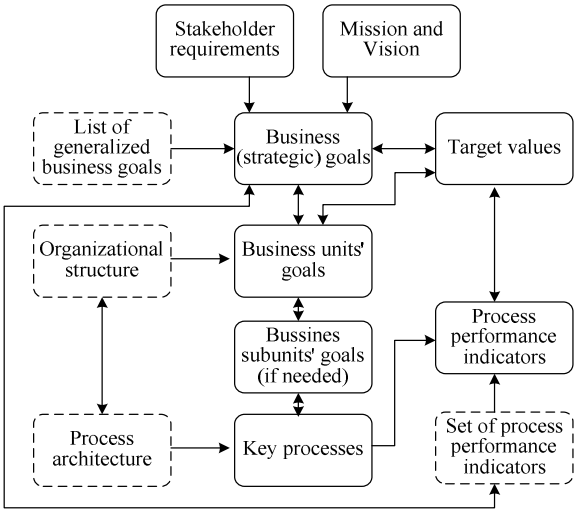
Source: Authors.

Considering first problem identified in literature review that most companies still struggle with implementation of process-based performance measures which should be integrated with strategic goals, the case study research demonstrated how the GPI model can be used for implementing process-based performance measures aligned with business goals, and case study evidence verified that GPI model is applicable and usable by companies. In order to implement process-based performance measures aligned with business goals based on GPI model, companies must have defined process architecture (that defines how its processes support its strategy). That's why the first criterion for selection the companies was defined.

Further, based on comments regarding the multiple levels of goals, we decided to incorporate that in a model in a way that it is acceptable for both, small and large companies (Figure 3). Also, we discussed with the rest of a companies and among each other, about including process goal definition in the model, and we concluded that, although definition of process goals can be found in literature (Kueng, 2000; Rummler and Brache, 2012; Yen, 2009), the need for that step wasn't recognized in most companies, so we decided not to do that.

Furthermore, based on the collected data in each company (list of business goals; list of business units' goals (aligned with strategic goals); list of key processes; list of PPIs; and for each business goal, one or a set of PPIs that could be measured), after their codification, categorization and generalization, a universal list of strategic goals (that can be applied in all companies) was created. It should be noted that strategic goals (in companies) were define according to SMART principles, and, due to their generalization in the coding phase, quantification part of the goal definition was omitted. The list includes the total of 37 different goals that are defined (in the same or similar way) in these companies. The same procedure was used for creating a list of key processes. The list contains 19 key processes (in general form). Performing those processes enables the achievement of predefined goals in all companies (from the case study). Process names are generalized, and for operational usage, it is recommended to adjust their names to a particular company. In a similar way, a list of generalized PPIs was defined. This list, containing total of 172 PPIs, facilitates PPI set selection for companies, in order to monitor and assess the achievement of goals.

F i g u r e 3
Modified GPI Model



Source: Authors.

The above mentioned lists were sent to the employers in charge (Table 2) in the companies, in order to verify them. They were also asked to comment on any strategic goal, BP or PPI that that they thought were missing from the lists. All 37 identified goals were verified, as well as all 19 key processes. Issues for which the companies were not wholly in agreement were related to list of PPIs. For

example, several companies argued that PPIs related to unpaid liabilities shouldn't be included in the list, but those PPIs were relevant to the several other companies, so none of those PPIs were removed. Further, some suggestion from companies led to modification of the generic names of several PPIs, and, since none of the companies were interested in going for further expanding of PPIs list, the list was verified. The mentioned lists became an integral part of a GPI model (Figure 3), but due to manuscript length restrictions, they are not shown here.

Furthermore, for each strategic goal from the list, a set of PPIs to be monitored were derived, in a basis of identified interdependencies between strategic goals and PPIs in each company (that was third result from the case study). Again, due to space restriction, this interdependency is shown here only for one business goal: *Bringing forward/fulfil deadlines* (Table 4). This goal is generalized, and means shortening or respecting the agreed delivery times of products and/or services. This goal (with various quantification parts) was defined in twenty-three companies from case study research.

T a b l e 4

PPIs for Monitoring the Achievement of Goal: *Bringing Forward/Fulfill Deadlines*

Generalized business goal:	**Bringing forward/fulfil deadlines**	**Number of Companies**
		23
Process performance indicator		
(Average) delivery time		
On-time delivery percentage		
Orders shipped that are complete and on time (delivery in full on time)		
Delivery Lead Time		
Order lead time		
Average order loading time		
Completion of projects on time		
Process set-up time		
Process cycle time		
Production cycle time (time in each stage)		
Percentage of activity cycle times realized according to the schedule		
Average sub-process turnaround time		
Queue production time ratio		
Average rework time		
(Average) process waiting time		
Downtime due to different types of equipment failure		
Time lost due to schedule changes or deviations from schedule		
Average time from customer inquiry to sales team response		
Production schedule delays because of material shortages		

Source: Authors.

This does not mean that a company has to measure all PPIs from the set in order to monitor accomplishment of defined strategic goal. Rather, company should choose those PPIs which are most cost-effective for measuring and which will provide accurate and correct data regarding the accomplishment of a strategic goal.

This way, the suggestion from the companies regarding a pre-defined set of generic PPIs for each business goal is accepted and incorporated into the model.

The second criticism to existing PPM models was related to lack of definition of the main characteristics, implementation steps, and the links between goals, BPs and PPIs, which would facilitate adaption of PPM system to changes in the environment. Although initial GPI model defined implementation steps, it has not explicitly identified the links between concrete goals, processes and PPIs. However, this need was also recognized in companies from the case study, so based on case study evidence, the modified and extended GPI model include those links, addressing completely, in that way, second problem identified in literature review.

Regarding the last suggestion from the companies – operationalization of PPIs, and given the fact that such problem is recognized in literature (third objection in literature review), data that were collected through case study research are not sufficient to make any conclusions about operationalization of PPIs. So, the current version of GPI model (Figure 3) does not include the operationalization of PPIs, but may be modified through further research.

Conclusions

The research presented in this paper describes the development of a GPI model, which aims to fill a gap in the literature regarding process performance measurement practice. Using evidence from the literature in a field of business performance measurement and business process management, and some practical experiences of the authors, an initial GPI PPM model was proposed. Model starts from the business goals (that are defined according to stakeholders' requirements), decomposes them on the business units' goals and links them to the key processes performance indicators. The intended purpose of the initial GPI model is to aid companies to measure performance of their key processes, by selecting the PPIs on the basis of its strategic goals. The initial model is tested through case study research, and the results verified that the model could achieve this aim. In that way, model addressed first problem identified in section 1.

Model was then modified and extended based on case study evidence collected in thirty-one companies that operates in different industries. Although initial GPI model defined implementation steps, it has not explicitly identified the links between concrete goals, processes and PPIs. This need was also recognized in companies from the case study, so based on case study evidence, the modified and extended GPI model include those links, addressing completely, in that way, second problem identified in section 1.

The GPI model has the potential to become a useful tool for managers in the following several ways: firstly, the model can be used as a guidance for establishing PPM system that is aligned with strategic goals of company – if managers want to define PPIs that are company-specific; secondly, the model can be used as it is, with a slight model customization (regarding the quantification of goals, detailed names of process, etc); and thirdly, the universal list of PPIs can be used as a source for best practice for process indicators by finding and selecting a subset of PPIs that fit goals of concrete company.

As this model provides the relationship between the strategy and performance of business process, it should increase the transparency of the business system and facilitate the selection of processes that are to be improved, based on the contribution of these processes to the fulfilment of strategic goals. However, the manner in which these processes will be treated is left to the company.

However, there are few limitations regarding this model to this study that need to be taken into account. Firstly, this model assumes that the company has defined process architecture, and it is not applicable to companies that are not process-oriented. Secondly, although the multiple case study research was conducted, the number of companies that applied this model is not sufficient enough for a solid validation of the PPM model. Thirdly, although the model has not been implemented in practice "from scratch", we believe that the responses we received from companies have helped us to improve practical applicability of the model. Finally, current version of GPI model does not address the problem that is related to the operationalization of PPIs. Although the need for PPIs operationalization is also recognized by the companies that participate in the case study research, the data collected in this research are not sufficient for making any conclusions about this topic.

Given the limitation mentioned above, the future research would include implementation of GPI model in a larger number of companies, including the possibility of investigation of operationalization of defined PPIs. In particular, operationalization of PPIs would involve exact procedures for calculating and measuring PPIs, thus resulting in a value that can be compared against a target value, as well as general recommendations for measurement frequency and templates that can be used for recording values and trends for each PPI. Furthermore, we believe that the model can improve the fulfillment of strategic goals of companies (e.g. performance, marketing position, etc.) but this is yet to be confirmed in practice. Also, taking into account that some companies suggested that defining of process goals should be explicitly incorporated in the model, and given a fact that some authors (Kueng, 2000; Rummler and Brache, 2012; Yen, 2009) emphasize the need for defining and measuring process goals, this topic also require more detailed research.

References

ANON (2013): Principal Business Activities of the Company – Companies Act. Available at: <http://www.companiesact.in/download/activity.pdf>. Accessed 11 January 2017.

ASHBY, A (2016): From Global to Local: Reshoring for Sustainability. Operation Management Research, *9*, No. 3, pp. 75 – 88

ASIF, M. – FISSCHER O. A. M. – JOOST DE BRUIJN, J. – PAGELL, M. (2010): Integration of Management Systems: A Methodology for Operational Excellence and Strategic Flexibility. Operation Management Research, *3*, No. 3, pp. 146 – 160.

BOKA, D. (2019): Practices and Challenges of Balanced Score Card Implementation in Nifas Silk Lafto Sub-City Education Offices. [PhD Dissertation.] Addis Ababa: Addis Ababa University.

BORDES, A. – TOUSSAINT, F. (2009): Tableaux de Bord et Indicateurs Pour une Performance Durable. Available at: <http:// www.bpms.info.com>. Accessed 12 March 2013.

BOSILJ-VUKŠIĆ, V. – GLAVAN, L. M. – SUŠA, D. (2015): The Role of Process Performance Measurement in bpm Adoption Outcomes in Croatia. Economic and Business Review, *17*, No. 1, pp. 117 – 143.

BROWN, M. G. (1996): Keeping Score: Using the Right Metrics to Drive World-Class Performance. New York: Quality Resources.

DE GUERNY, J. – GUIRIEC, J. C. – LAVERGNE, J. (1990): Principes et Mise en Place du Tableau de Bord de Gestion. 6th ed. Paris: J. Delmas.

DEL-RÍO-ORTEGA, A. – RESINAS, M. – CABANILLAS, C. – RUIZ-CORTÉS, A. (2013): On the Definition and Design-time Analysis of Process Performance Indicators. Information Systems, *38*, No. 4, pp. 470 – 490.

DEL-RÍO-ORTEGA, A. – RESINAS, M. – DURAN, A. – RUIZ-CORTÉS, A (2012): Defining Process Performance Indicators by Using Templates and Patterns. In: BARROS, A., GAL, A. and KINDLER, E. (eds): BPM 2012. Berlin: Springer, Heidelberg, pp. 223 – 228.

DRIVA, H – PAWAR, K. S. – MENON, U. (2000): Measuring Product Development Performance in Manufacturing Organizations. International Journal of Production Economics, *63*, No. 2, pp. 147 – 159.

DUMAS, M. – LA ROSA, M. – MENDLING, J. – REIJERS, H. (2013): Fundamentals of Business Process Management. Berlin: Springer-Verlag.

EFQM (2009): EFQM Excellence Model. Brussels, Belgium.

FRANCESCHINI, F. – GALETTO, M. – MAISANO, D. (2019): Designing Performance Measurement Systems – Theory and Practice of Key Performance Indicators. Cham: Springer.

GAVUROVÁ, B. (2011): Systém Balanced Scorecard v podnikovom riadení. Ekonomický časopis/ Journal of Economics, *59,* No. 2, pp. 163 – 177.

GILL, J. – JOHNSON, P. (2002): Research Methods for Managers. Third Edition. London, UK: Sage.

GLAVAN, L. J. (2011): Understanding Process Performance Measurement Systems. Business Systems Research, *2*, No. 2, pp. 25 – 38.

GLOVA, J. – MRÁZKOVÁ, S. (2018): Impact of Intangibles on Firm Value: Empirical Evidence from European Public Companies. Ekonomický časopis/Journal of Economics, *66*, No. 7, pp. 665 – 680.

GÜNDÜZ, M. (2015): Value Stream Performance Measurement in Lean Manufacturing Business. International Business and Management, *10,* No. 3, pp. 40 – 47.

HAMMER, M. (2007): The 7 Deadly Sins of Performance Measurement and How to Avoid Them. MIT Sloan Management Review, *48,* No. 3, pp. 19 – 30.

HARMON, P. (2019): Business Process Change: Management Guide for Managers and Process Professionals. 4th ed. Cambridge, MA: Morgan Kaufman Publishers.

HECKL, D. – MOORMANN, J. (2010): Process Performance Management. In: vom BROCKE, J. and ROSEMANN, M. (eds): Handbook on Business Process Management 2: Strategic Alignment, Governance, People and Culture. Berlin: Springer, pp. 115 – 135.

HERNAUS, T. – PEJIĆ BACH, M. – BOSILJ VUKŠIĆ, V. (2012): Influence of Strategic Approach to BPM on Financial and Non-financial Performance. Baltic Journal of Management, *7*, No. 4, pp. 376 – 396.

JESTON, J. – NELIS, J. (2008): Management by Process: A Roadmap to Sustainable Business Process Management. Oxford: Butter-Heinemann, Elsevier Ltd., Jordan Hill.

KAPLAN, S. R. – NORTON, D. P. (1993): Putting the Balanced Scorecard to Work. Harvard Business Review, *71*, No. 5, pp. 134 – 147.

KENNERLEY, M. – NEELY, A. (2002): A Framework of the Factors Affecting the Evolution of Performance Measurement Systems. International Journal of Operations and Production Management, *22*, No. 11, pp. 1222 – 1245.

KOHLBACHER, M. – GRUENWALD, S. (2011): Process Orientation: Conceptualization and Measurement. Business Process Management Journal, *17*, No. 2, pp. 267 – 283.

KRONZ, A. (2006): Managing of Process Key Performance Indicators as Part of the Aris Methodology. In: SCHEER, A. W., JOST, W., HEß, H. and KRONZ, A. (eds): Corporate Performance Management. Berlin: Springer, pp. 31 – 44.

KUENG, P. (2000): Process Performance Measurement System – A Tool to Support Process – Based Organizations. Total Quality Management, *11*, No. 1, pp. 67 – 85.

LIST, B. – MACHACZEK, K. (2004): Towards a Corporate Performance Measurement System. Paper Presented at the ACM Symposium on Allied Computing. Available at: <http://wit.at/people/list/publications/acmsac2004.pdf>.

LYNCH, R. L. – CROSS, K. F. (1991): Measure Up! Yardsticks for Continuous Improvement. Cambridge: Blackwell.

MALOVA, I. I. (2010): Integration of a Balanced System of Indicators in Internal Planning at a Chemical Enterprise (In Russian). [PhD Dissertation.] Moscow: State University of Management.

MUDA, S. – HENDRY, L. (2002): Developing a New World Class Model for Small and Medium Sized Make-to-order Companies. International Journal of Production Economics, *78*, No. 3, pp. 295 – 310.

NEELY, A. D. – MILLS, J. – PLATTS, K. – RICHARDS, H. – GREGORY, M. – BOURNE, M. – KENNERLEY, M. (2000): Performance Measurement System Design: Developing and Testing a Process-based Approach. International Journal of Operations and Production Management*, 20,* No. 10, pp. 1119 – 1145.

NEELY, A. D. – KENNERLEY, M. – ADAMS, C. (2007): Performance Measurement Frameworks: A Review. In: A. NEELY (ed): Business Performance Measurement, Unifying Theories and Integrating Practice. Cambridge: Cambridge University Press, pp. 143 – 162.

OGLOBLIN, V. A. – MALANINA, Y. N. – VIKHOREVA, M. V. (2019): Improving the Management Tools of Engineering Enterprises in Modern Conditions. Journal of Physics: Conference Series 1399, No. 3, pp. 033060.

PARISI, C. (2010): Using Qualitative System Dynamics to Enhance the Performance Measurement of Sustainability. In: TATICCHI, P. (ed.): Business Performance Measurement and Management – New Contexts, Themes and Challenges. Berlin: Springer-Verlag, pp. 115 – 130.

PARMENTER, D. (2010): Key Performance Indicators – Developing, Implementing, and Using WinPIs. New Jersey: John Wiley and Sons.

PAVLOV, A. – BOURNE, M. (2011): Explaining the Effects of Performance Measurement on Performance: An Organizational Routines Perspective. International Journal of Operations and Production Management, *31,* No. 1, pp. 101 – 122.

POOT, L. (2018): How Should Companies Choose and Integrate the Adequate Measures for Performance Measurement? [Master's Dissertation.] Ghent, Belgium: Ghent University, Faculty of Economics and Business Administration.

POPOVA, V. – SHARPANSKYKH, A. (2010): Modeling Organizational Performance Indicators. Information Systems, *35*, No. 4, pp. 505 – 527.

PULAKOS, E. D. (2009): Performance Management: A New Approach for Driving Business Results. Oxford, UK: John Wiley and Sons.

RADOVIĆ, M. – TOMAŠEVIĆ, I. – STOJANOVIĆ, D. – SIMEUNOVIĆ, B. (2009): Establishing System for Process Oriented Performance Management. Paper presented a12th International QMOD and Toulon-Verona Conference, Verona, Italy.

RUMMLER, G. A. – BRACHE, A. P. (2012): Improving Performance: How to Manage the White Space on the Organization Chart. San Francisco, CA: Jossey-Bass.

SAMSONOWA, T. – BUXMANN, P. – GERTEIS, W. (2009): Defining KPI Sets for Industrial Research Organizations – A Performance Measurement Approach. International Journal of Innovation Management, *13*, No. 02, pp. 157 – 176.

SHAH, L. – ETIENNE, A. – SIADAT, A. – VERNADAT, F. B. (2012): (Value, Risk) – Based Performance Evaluation of Manufacturing Processes. IFAC Proceedings Volumes, *45*, No. 6, pp. 1586 – 1591.

SIMEUNOVIĆ, B. (2015): Razvoj modela za merenje performansi procesa. [PhD Dissertation.] Belgrade: Faculty of Organizational Sciences,

STRITESKA, M. – SPICKOVA, M. (2012): Review and Comparison of Performance Measurement Systems. Journal of Organizational Management Studies, *2012,* No. 2012, pp. 1 – 13.

ŠOFRANKOVÁ, B. – KISEĽÁKOVÁ, D. – HORVÁTHOVÁ201 J. (2017): Actual Questions of Risk Management in Models Affecting Enterprise Performance. Ekonomický časopis/Journal of Economics, *65*, No. 7, pp. 644 – 667.

TEPLICKÁ, K. – DAUBNER, M. – AUGUSTÍNOVÁ, E. (2015): Analýza prícinných vztahov medzi vybranými faktormi v procese riadenia výkonnosti slovenských priemyselných podnikov. Ekonomický časopis/Journal of Economics, *63*, No. 5, pp. 504 – 523.

VAN LOOY, A. – SHAFAGATOVA, A. (2016): Business Process Performance Measurement: A Structured Literature Review of Indicators, Measures and Metrics. SpringerPlus, *5*, No. 1, pp. 1 – 24.

WIELAND, U. – FISCHER, M. – PFITZNER, M. – HILBERT, A. (2015): Process Performance Measurement System – Towards a Customer-oriented Solution. Business Process Management Journal, *21*, No. 2, pp. 312 – 331.

YEN, V. C. (2009): An Integrated Model for Business Process Measurement. Business Process Management Journal, *15*, No. 6, pp. 865 – 875.

YIN, R. K. (2009): Case Study Research: Design and Methods Fourth Edition. Los Angeles: Sage.